What is claimed is:

1. A method for measuring a true mean differential group delay $\langle\tau\rangle$ of at least one length of optical fiber comprising the steps of:

measuring a mean square differential group delay $\langle\tau^2\rangle_B$ averaged over a finite bandwidth B of the source using a polarization mode dispersion measurement apparatus;

calculating a root mean square differential group delay in accordance with $\sqrt{\langle\tau^2\rangle_B}$; and

applying a systematic correction factor ϵ to $\sqrt{\langle\tau^2\rangle_B}$ to calculate $\langle\tau\rangle$, the application of ϵ minimizing a systematic error caused by the finite bandwidth B of the source, where τ is in units of second, B in units of radian/second.

2. The method of Claim 1, further including the step of applying the systematic correction factor ϵ in accordance with:

$$\langle\tau\rangle = \sqrt{\frac{8}{3\pi}\langle\tau^2\rangle_B} + \epsilon, \qquad \text{(16a)}$$

where π is substantially equal to 3.14159 and $\langle\tau\rangle$ is in units of second, $\langle\tau^2\rangle_B$ is in units of second^2.

3. The method of Claim 2, wherein the finite bandwidth B is much greater than the inverse of the root mean square differential group delay $\sqrt{\langle\tau^2\rangle_B}$:

$$B >> \frac{1}{\sqrt{\langle\tau^2\rangle_B}},$$

further wherein ε is defined by the following equation:

$$\varepsilon = \frac{8}{9\sqrt{2}}\frac{1}{B}, \quad \text{and} \qquad \text{(16b)}$$

where B is in units of radian/second, and τ and $\sqrt{\langle\tau^2\rangle_B}$ are in units of second.

4. The method of Claim 1, wherein the polarization mode dispersion measurement apparatus used to measure the mean square differential group delay $\langle \tau^2 \rangle_B$ comprises a time-domain measurement apparatus.

5. The method of Claim 4, wherein the time-domain measurement apparatus is an interferometric device.

6. The method of Claim 1, wherein the polarization mode dispersion measurement apparatus used to measure the mean square differential group delay $\langle \tau^2 \rangle_B$ comprises a frequency-domain measurement apparatus.

7. The method of Claim 6, wherein the frequency-domain measurement apparatus is a polarimeter.

8. The method of Claim 7, further comprising the step of applying one of a Jones Matrix Eigenanalysis, Poincaré Sphere Analysis, and Müller Matrix Method to calculate the mean square differential group delay $\langle \tau^2 \rangle_B$.

9. The method of Claim 1, wherein the at least one length of optical fiber is an optical fiber link in an optical telecommunication network.

10. The method of Claim 1, wherein the at least one length of fiber is an optical fiber route in an optical telecommunication network.

11. A method for measuring a mean differential group delay $\langle \tau \rangle$ of at least one length of optical fiber, comprising the steps of:

characterizing a polarization mode dispersion vector as a function of frequency using a frequency-domain polarization mode dispersion measurement apparatus;

calculating a second-order polarization mode dispersion vector $\vec{\tau}_\omega$ as a function of frequency by calculating a derivative with respect to frequency of the polarization mode dispersion vector;

calculating a mean of a square root of a magnitude of the second-order polarization mode dispersion vector $\vec{\tau}_\omega$ to obtain a first result, according to $\left\langle |\vec{\tau}_\omega|^{1/2} \right\rangle$, wherein $|\vec{\tau}_\omega|$ represents the magnitude of the second-order polarization mode dispersion vector; and

multiplying a proportionality coefficient A_2 of the second-order polarization mode dispersion vector $\vec{\tau}_\omega$ by the first result to calculate the mean differential group delay $\langle \tau \rangle$ in accordance with the following equation:

$$A_2 \left\langle |\vec{\tau}_\omega|^{1/2} \right\rangle = \langle \tau \rangle, \qquad (21)$$

where τ and $\langle \tau \rangle$ are in units of second^2, $|\tau_\omega|$ is in units of second, ω is in units of radian/second, and A_2 is dimensionless.

12. The method of Claim 11, wherein A_2 is substantially equal to 1.37.

13. The method of Claim 11, wherein the frequency-domain polarization mode dispersion measurement apparatus is one of a polarimetric device and a Fixed Analyzer device.

14. The method of Claim 11, wherein the at least one length of fiber is a single fiber link.

15. The method of Claim 11, wherein the at least one length of fiber is a fiber route.

16. A method for measuring a mean differential group delay $\langle \tau \rangle$ of at least one length of fiber, comprising the steps of:

measuring a magnitude of a polarization mode dispersion vector $|\tau_\omega|$ as a function of frequency, using a frequency-domain polarization mode dispersion measurement apparatus, the magnitude of the polarization mode dispersion vector $|\tau_\omega|$ being a scalar differential group delay;

calculating a frequency derivative of the scalar differential group delay from the magnitude of the polarization mode dispersion vector, the frequency derivative of the scalar differential group delay $\frac{d|\vec{\tau}|}{d\omega}$ being a scalar second-order polarization mode dispersion function;

calculating a first result, according to $\left\langle \left| \frac{d\left|\vec{\tau}\right|}{d\omega} \right|^{1/2} \right\rangle$, where $\left|\tau\right|$ is in units of second and ω is a frequency in units of radian/second; and

multiplying a proportionality coefficient B_2 by the first result to calculate the mean differential group delay, in accordance with the following equation:

$$B_2 \left\langle \left| \frac{d\left|\vec{\tau}\right|}{d\omega} \right|^{1/2} \right\rangle = \langle \tau \rangle, \qquad (26)$$

where B_2 is dimensionless, τ and $\langle \tau \rangle$ are in units of second, ω is in units of radian/second, and $\frac{d\left|\vec{\tau}\right|}{d\omega}$ is in units of second^2.

17. The method of Claim 16, wherein B_2 is substantially equal to 2.64.

18. The method of Claim 16, wherein the frequency-domain polarization mode dispersion measurement apparatus comprises one of a polarimetric device and a Fixed Analyzer device.

19. The method of Claim 16, wherein the at least one length of optical fiber is a single optical fiber link.

20. The method of Claim 16, wherein the at least one length of optical fiber is an optical fiber route.

21. A method for measuring a mean square differential group delay τ^2_{RMS} of at least one length of optical fiber, comprising the steps of:

measuring a polarization mode dispersion vector as a function of frequency, using a frequency-domain polarization mode dispersion measurement apparatus;

calculating a second-order polarization mode dispersion vector $\vec{\tau}_\omega$ as a function of frequency by calculating a derivative of the polarization mode dispersion vector with respect to frequency ω;

calculating the mean of the magnitude of the second-order polarization mode dispersion vector $\left|\vec{\tau}_\omega\right|$ to obtain a first result, according to $\left\langle \left|\vec{\tau}_\omega\right| \right\rangle$; and

multiplying a proportionality coefficient A_1 by the first result to calculate the mean square differential group delay, in accordance with the following equation:

$$A_1\left\langle\left|\vec{\tau}_\omega\right|\right\rangle = \tau^2_{RMS}, \qquad (20)$$

where A_1 is dimensionless, $\left|\vec{\tau}_\omega\right|$ is in units of second^2 and $\tau^2{}_{RMS}$ is in units of second^2.

22. The method of Claim 21, wherein A_1 is substantially equal to 2.02.

23. The method of Claim 21, wherein the frequency-domain polarization mode dispersion measurement apparatus comprises one of a polarimetric device and a Fixed Analyzer device.

24. The method of Claim 21, wherein the at least one length of optical fiber is a single optical fiber link.

25. The method of Claim 21, wherein the at least one length of optical fiber is an optical fiber route.

26. A method for measuring a mean square differential group delay $\tau^2{}_{RMS}$ of at least one length of optical fiber, comprising the steps of:

measuring a magnitude of a polarization mode dispersion vector as a function of frequency using a frequency-domain polarization mode dispersion measurement apparatus, the magnitude of the polarization mode dispersion vector being a scalar differential group delay;

calculating a frequency derivative of the scalar differential group delay from the magnitude of the polarization mode dispersion vector, the frequency derivative of the scalar differential group delay $\frac{d\left|\vec{\tau}\right|}{d\omega}$ being a scalar second-order polarization mode dispersion function;

calculating a first result, according to $\left\langle\left|\frac{d\left|\vec{\tau}\right|}{d\omega}\right|\right\rangle$; and

multiplying a proportionality coefficient B_1 by the first result to calculate the mean square differential group delay, in accordance with the following equation:

$$B_1\left\langle\left|\frac{d|\vec{\tau}|}{d\omega}\right|\right\rangle = \tau^2_{RMS}, \qquad (25)$$

where B_1 is dimensionless, and $\frac{d|\vec{\tau}|}{d\omega}$ is in units of second^2.

27. The method of Claim 26, wherein B_1 is substantially equal to 6.80.

28. The method of Claim 26, wherein the frequency-domain polarization mode dispersion measurement apparatus comprises one of a polarimetric device and a Fixed Analyzer device.

29. The method of Claim 26, wherein the at least one length of optical fiber is a single optical fiber link.

30. The method of Claim 26, wherein the at least one length of optical fiber is an optical fiber route.

31. A method for measuring a mean polarization mode dispersion of at least one length of optical fiber, using a source of bandwidth B, comprising the steps of:

collecting polarization mode dispersion data as a function of frequency from a frequency-domain polarization mode dispersion measurement apparatus;

extracting one of a vector and a scalar frequency-dependent function from the polarization mode dispersion data, by applying a frequency-domain polarization mode dispersion technique, the one of the vector and the scalar function being one of a first-order and a second-order polarization mode dispersion function;

applying a systematic correction to the one of the vector and the scalar frequency-dependent function, the systematic correction minimizing a systematic error caused by bandwidth B; and wherein

applying the systematic correction results in a derivation of one of a mean differential group delay $\langle\tau\rangle$ and a mean square differential group delay τ^2_{RMS}.

32. A method of measuring a mean differential group delay $\langle\tau\rangle$ of a length of optical fiber comprising the steps of:

deriving a first mean $\langle\tau\rangle$ in accordance with equation (21) and Claim 11;

deriving a second mean $\langle \tau \rangle$ in accordance with equation (26) and Claim 16;

deriving a linear equation of the first mean $\langle \tau \rangle$ and the second mean $\langle \tau \rangle$ to calculate a combined mean $\langle \tau \rangle$, wherein a sum of coefficients of the linear equation is substantially equal to one.

33. A method of measuring a mean square differential group delay τ^2_{RMS} of a length of optical fiber comprising the steps of:

deriving a first mean square differential group delay τ^2_{RMS} in accordance with equation (20) and Claim 21;

deriving a second mean square differential group delay τ^2_{RMS} in accordance with equation (25) and Claim 26;

deriving a linear equation of the first mean square differential group delay τ^2_{RMS} and the second mean square differential group delay τ^2_{RMS} to calculate a combined mean square differential group delay τ^2_{RMS}, wherein a sum of coefficients of the linear equation is substantially equal to one.